Introduction

- There are significant disparities in drug overdose rates across urban neighborhoods. Alcohol outlets may be one neighborhood feature that contributes to neighborhood disparities for drug overdose.
- More alcohol outlets are generally found in economically depressed, predominantly-minority neighborhoods, exacerbating health disparities in these communities.\(^2\)
- Areas in close proximity to alcohol outlets may present as opportune locations for illicit drug sales as alcohol outlets are often located in communities with low social capital and collective efficacy.\(^3\)
- Alcohol outlets licensed to sell alcohol for off-premise consumption are more strongly associated with drinking problems, violence, and crime that drug arrests corrected to outlets licensed for on-premise consumption only.\(^4\)
- Few studies have looked at the associations between alcohol outlets and drug overdose. There is some evidence that alcohol outlet density is related to increased drug use; proximity to alcohol outlets is associated with past year marijuana use in youth.\(^5\)
- AIM: To investigate the impact of alcohol outlets on the neighborhood drug overdose rate; to evaluate possible changes in this relationship over time from 2013 to 2017.

Methods

- Drug overdose data: EMS records, in 2013 (n=2,330) and 2017 (n=8,454), aggregated to census block group (n=693). An EMS run was considered a drug overdose if the primary or secondary impression was listed as “substance/drug abuse” or “withdrawal/overdose drugs.”
- Alcohol outlet locations: Board of License Commissioners for Baltimore City, 2014. Off-premise (n=726); On-premise (n=531).
- Neighborhood Disadvantage score\(^6\): Using the formula \( \frac{[(c/10+d/10)-(a/10+b/10)]}{4} \) with 5-year Census percentages for: (a) adults ≥25 years with a college degree, (b) owner-occupied housing, (c) households with incomes below the federal poverty threshold, (d) female-headed households with children; range=[-5 is very low/little disadvantage, +5 is very severe disadvantage].
- Percent of vacant lots—Baltimore City Housing Authority, 2015. Divided number of vacant lots by the total number of land parcels to calculate the percent of vacant lots in each block group.
- Demographic variables by census block group.

Analysis

- Alcohol outlet and overdose locations geocoded, mapped, and aggregated to census block group in ArcGIS 10.4.
- Negative Binomial regression in R 3.3, analyzed counts of drug overdose per census block group and 44.5% (n=3,758) of 2017 overdoses received naloxone, indicating possible opioid-involved overdose.

Results

Distribution of Drug Overdoses and Alcohol Outlets by Census Block Group

Maps of drug overdoses in (A) 2013 (n=2,330) and (B) 2017 (n=8,454); (C) off-premise alcohol outlets (n=726) and (D) on-premise alcohol outlets (n=530) in 2014, by Baltimore City census block group.

Rate of Drug Overdose by Census Block Group, Baltimore City, 2013 and 2017

<table>
<thead>
<tr>
<th>Variable</th>
<th>2013 Adjusted All Alcohol IRR (95% CI)</th>
<th>2013 Adjusted Outlet Type IRR (95% CI)</th>
<th>2017 Adjusted All Alcohol IRR (95% CI)</th>
<th>2017 Adjusted Outlet Type IRR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All alcohol outlets</td>
<td>1.07 (1.06, 1.10)</td>
<td>1.11 (1.05, 1.18)</td>
<td>1.09 (1.07, 1.11)</td>
<td>1.20 (1.15, 1.26)</td>
</tr>
<tr>
<td>Off-premise alcohol outlets</td>
<td>1.05 (1.01, 1.09)</td>
<td>1.02 (0.98, 1.05)</td>
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<tr>
<td>Vacant lot %</td>
<td>1.40 (0.53, 3.75)</td>
<td>1.32 (0.50, 3.54)</td>
<td>4.91 (2.23, 10.99)</td>
<td>3.92 (1.81, 8.64)</td>
</tr>
<tr>
<td>Neighborhood disadvantage</td>
<td>1.21 (1.13, 1.30)</td>
<td>1.20 (1.12, 1.29)</td>
<td>1.23 (1.16, 1.30)</td>
<td>1.23 (1.16, 1.30)</td>
</tr>
<tr>
<td>Median household income (in $10,000s)</td>
<td>0.96 (0.92, 1.01)</td>
<td>0.96 (0.92, 1.01)</td>
<td>0.93 (0.90, 0.96)</td>
<td>0.93 (0.90, 0.97)</td>
</tr>
<tr>
<td>Population density (per square mile in 10,000 residents)</td>
<td>--</td>
<td>--</td>
<td>1.09 (1.07, 1.11)</td>
<td>1.20 (1.15, 1.26)</td>
</tr>
</tbody>
</table>

Discussion

- Each additional off-premise alcohol outlet was associated with an 11.4% increase in the neighborhood drug overdose rate in 2013; the strength of this association increased to 19.9% in 2017, adjusting for other neighborhood variables.
- On-premise alcohol outlets were marginally significant correlates of neighborhood drug overdose rate in 2013 but were not significantly associated with the drug overdose rate in 2017.
- Information on specific substances involved in overdose was not available; 31.5% (n=736) of 2013 overdoses and 44.5% (n=3,758) of 2017 overdoses received naloxone, indicating possible opioid-involved overdose.
- This study provides preliminary public health evidence for informing policy decisions about alcohol outlet licensing and zoning.
- Alcohol outlets could be potential community partners for harm reduction strategies such as naloxone distribution or health communication on drug purity or identifying overdose symptoms.

References

5. Miller AL, Stillman CW, Suzman C, et al. Board of License Commissioners for Baltimore City, 2014. Off-premise alcohol outlets (n=726); On-premise (n=531). An EMS run was considered a drug overdose if the primary or secondary impression was listed as “substance/drug abuse” or “withdrawal/overdose drugs.”

Note: From negative binomial regression *Adjusted for other covariates in the column

Funding: NIH/NINDA [grants K01DA049900, R34DA034314, R34DA034314-01]; NIH/NIMHD [grant number U54MD011277] CDC [grants R01CE02682, R49CE030304, U49CE000728]. No conflicts of interest to report.